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PEDAL AND SHOE WEDGE ASSEMBLY UNIT WITH QUICK COUPLING AND DECOUPLING  
[ENSEMBLE DE PEDALE ET DE CALE DE CHAUSSURE, A ACCOUPLEMENT ET  
DESACCOUPLEMENT RAPIDES]

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The invention concerns a pedal and shoe wedge assembly with quick coupling and decoupling.

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The subject of the invention is related to the technical area of parts of bicycles and similar vehicles necessary for propulsion.

New kinds of pedals are currently being marketed that eliminate the need for toe clips and tightening straps for the feet.

Many devices are known that are comprised of a pedal and a shoe wedge equipped to be quickly connected or disconnected and in principle to assure effective pedaling with the safety necessary in particular during falls when the bicyclist must be able to instantly free his feet from the pedals.

Generally, the known devices rely on the design of a pedal platform that receives the shoe wedge. This surface must be approximately horizontal when the bicyclist desires to engage his foot on the pedal. However, considering the weight and the off centered position of the parts that comprise the pedal, this surface at a position of rest most frequently is in an approximately vertical plane; this requires a preliminary action that is very inconvenient to bring it back into a horizontal plane that will allow coupling after a frequently uncomfortable effort to find the ratcheting position.

On the other hand, the most of these devices are relatively heavy, are complicated to manufacture and are quite expensive, which

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\* Numbers in the margin indicate pagination in the foreign text.

limits their installation to upscale bicycles. One should note that in the majority of existing devices the shoe wedge is subject to rapid wear. Indeed, the wedge often has one or several interior notches to allow integration with the pedal. These numerous operations lead to rapid deterioration of the wedges and it is the norm that during one season it will be necessary to use three sets of wedges. Moreover, the wedges are secured to the shoes. When the cyclist is moving the existing shapes of the wedges established as a function of their ratcheting system make them more fragile. /2

The main goal of the invention is to come up with a pedal and wedge assembly unit that is light, rugged, efficient, of simple design and therefore economical, which will offer all the safety necessary during pedaling and disconnection, and which will avoid any preliminary orientation of the pedal for the purpose of engagement.

For this purpose and according to a primary characteristic, the assembly is notable in that it is comprised of a shoe wedge whose external side has in its middle part a shaped transverse indented section that forms the support and centering mount, equipped at each end with some male connection and holding devices for a pedal, the latter including a central part that has a section complementary to the indented section for longitudinal positioning of the wedge, a lateral part that is equipped with a female device that is complementary to the said male connection and holding devices, and an opposite lateral part that is elastically movable due to the effect

of engagement or disengagement of the shoe equipped to assure coupling or decoupling of the wedge by other female devices that are complementary to the said male connection and holding devices.

According to another characteristic the male connection and holding devices are made with overlapping edges exterior to the lateral planes of the wedge.

Another characteristic lies in the fact that the male connection and holding devices are designed in the form of semi-circular projections.

According to another characteristic the female connection and holding devices are recesses that marry the profiles of the male devices and are made on the fixed lateral part and on the movable lateral part of the pedal, on the side facing the lateral planes of the wedge.

Another characteristic resides in the fact that the central part of the pedal has hollow cylindrical cross section and the indented section of the wedge is concave and semi-circular. /3

These characteristics and others will be apparent from the following description.

In order to define the object of the invention without thereby limiting it, in the attached drawings:

- Figure 1 is a sectional view that shows a wedge and pedal assembly in coupling position and according to an initial form of implementation of the pedal.

- Figure 2 is a sectional view that shows a wedge and pedal assembly in coupling position and according to another form of implementation of the pedal.
- Figure 3 is a top view of the coupled wedge and pedal assembly.
- Figure 4 is a sectional view seen along the broken line 4-4 of Figure 3.
- Figure 5 is a perspective view that shows the wedge on the external side and its attachment parts to the shoe.
- Figure 6 is a perspective view that shows the wedge on the on the side facing attachment to the show.
- Figure 7 is a partial view that shows the decoupled position of the wedge and pedal assembly.
- Figure 8 is a view that shows the wedge and pedal assembly at the beginning of coupling.

In order to make the object of the invention more specific, we shall now describe it in non-limiting forms of implementation shown in the figures of the drawings.

The wedge (1) more particularly illustrated in Figures 5 and 6 is preferably made of a plastic material and includes one side (1a) of attachment to the shoe with slightly concave shape in the longitudinal direction in order to marry the shape of the shoe in this place, and with pointed barbs (1b) that penetrate the sole.

The opposite external side (1c) is formed from two curved surfaces (1d) that gradually separate from the side (1a) by moving away from the ends and come together in the middle part at a plane surface (1e) that is interrupted by a transverse indented part (1f) that forms a support and centering mount and is of semi-circular shape for example. /4

The ends of the indented section are equipped to form male connection and holding devices.

These devices extend beyond the lateral planes (1j1 - 1j2) of the wedge and are, for example, semi-circular projections (1g1 - 1g2). Finally, some gaps that are staggered and offset (1h) are made starting from side (1c) to receive support plates (2) of which the elongated opening (2a) is traversed by some adjustment and attachment screws (V) in the sole.

The pedal (P) is comprised of a shaft (3) screwed in by its threaded end (3a) into the eye of the crank (M) and equipped near each end to receive in the known way some needle bearings (RA) or ball bearings (RB) as shown in Figure 1, or even some ball races (CB) as shown in Figure 2, preferably with some sealing devices.

The external cages of the bearings or races are housed in some borings (4a-4b) formed at the ends of a hub (4) made of a light alloy that has on the crank side a cylindrical or cylindrical-conical part (4c).

A central and hollow part (4d) extends beyond the part (4c) with diameter less than the diameter of part (4c), and an annular recess (4e) is made on the side that connects the parts (4c - 4d) to comprise female connection and holding devices of the wedge.

On the other side the central part (4d) is extended by a cylindrical bearing surface (4f) of greater diameter than the part (4d) and separated from it by a flange (4g). A plug (5) is screwed into the bore (4b) of the hub up to the support of its neck (5a) against the end side of the hub and against a sealing washer (6) installed in sliding manner on the bearing surface (4f).

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A cylindrical ring (7) is installed in sliding manner on the bearing surface (4f) through the bore (7a) of one wall (7b) housed between the flange (4g) and the washer (6). On the side facing the central part (4d), the wall (7b) is connected to the end of the ring by a circular recess (7c) that has a diameter slightly greater than that of the flange (4g) and that comprises the other female connecting and holding device, while on the other side, the wall is connected to the end of the ring by a bore (7d) having a diameter slightly greater than that of the washer (6).

An appropriately calibrated coil spring (8), which tends to hold the ring (7) in a position of minimum separation from the part (4c) of the hub, is installed between the said washer and the wall (7b).

We should now describe operation of the wedge and pedal assembly with reference to Figures 7 and 8 of the drawings in particular.



When the bicyclist desires to couple the wedges to the pedals, it suffices to place his foot above the pedal in such a way that the indented section (1f) of the wedge is approximately above the central part (4d) of the pedal (Figure 8). At this moment, the lateral projecting parts (1g1-1g2) of the wedge are applied to the ends of the fixed part (4c) of the pedal and of the movable ring (7), as is shown in Figure 8. During the same natural movement the bicyclist exerts a force (F1) with his foot that causes retreat (arrow F2) of the ring (7) in opposition to its spring (8), until the lateral projecting parts (1g1) and (1g2) can be engaged between the parts (4c) and (7). When the wedge is being supported by centering of its indented section (1f) on the central part (4d), the ring (7) can resume its initial position due to the action of the spring, pushing back the wedge from the side of the crank until the lateral plane (1j1) of the wedge abuts against the fixed part (4c) of the pedal (Figures 1 and 2). In this position the other lateral projecting part (1g2) is covered by the recess (7c) of the ring (7) that rests elastically against the lateral plane (1j2) of the wedge, thereby creating a pinching action necessary for firm coupling with the pedal. /6

When the bicyclist wants to quickly remove his foot from the pedal, especially in case of a fall, it suffices for him to move his foot to the outside (arrow F3, Figure 7). In this natural movement, the lateral plane (1j2) of the wedge, the ring (7) is forced to

retreat toward the free end of the pedal (arrow F4), and the opposite projection (1gi) is then disengaged from the recessed area (4e), which allows the bicyclist to easily decouple by raising the foot toward the outside (arrow F5).

The advantages are apparent from the description, of which we can emphasize:

- The speed and the ease of coupling the wedge to the pedal because of the cylindrical shape of the pedal in the area of the support of the wedge that avoids any preliminary orientation, and of the natural movement of the foot support;
- The effective flexible pedaling, and certain because of the firm holding of the wedge and the support zone very near the pedal shaft;
- Easy and quick decoupling obtained by transverse disengagement to the outside of the foot, in the direction where the foot must be supported on the ground, which offers great security to the bicyclist;
- Easy and economical production of the assembly that guarantees good reliability and applicability to all kinds of bicycles;
- Lightness of the simplified assembly made of plastic and light alloy materials.

## CLAIMS

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1. Pedal and shoe wedge assembly with rapid coupling and decoupling, characterized in that it is comprised of a shoe wedge whose external side (1c) has in its middle part a transverse indented section (1f) that forms a support and centering mount, equipped at each end with male connection and holding devices (1g1-1g2) of the pedal (4), the latter including a central part (4d) having a cross section complementary to the indented section for longitudinal positioning of the wedge, a lateral, fixed part (4c) on the side of the crank (M) provided with a female device (4e) that is complementary to the said male connection and holding devices, and an opposite lateral part (7) that moves elastically due to the effect of engagement or disengagement of the shoe, equipped to assure coupling or decoupling of the wedge by other female devices (7c) that are complementary to the said male connection and holding devices.

2. Assembly according to Claim 1 characterized in that the male connection and holding devices (1g1-1g2) are made with edges extending beyond the lateral planes (1j1-1j2) of the wedge.

3. Assembly according to Claim 1 characterized in that the male connection and holding devices are produced in the form of semi-circular protecting parts.

4. Assembly according to Claim 1 characterized in that the female connection and holding devices are recessed areas (4e-7c) that marry the profile of the male devices and that are placed on the

fixed central part (4c) and on the lateral movable part (7) of the pedal, on the side facing the lateral planes (1j1-1j2) of the wedge.

5. Assembly according to Claim 1 characterized in that the central part (4d) of the pedal has a cylindrical hollow cross section /8 and the indented section (1f) of the wedge has a concave and semi-circular profile.

6. Assembly according to Claim 1 characterized in that the fixed lateral part (4c) of the pedal is of general cylindrical or cylindrical-conical shape, with external diameter greater than the diameter of the central part (4d), with the female connection and holding device (4e) on the side facing the wedge produced in the form of an annular recessed area.

7. Assembly according to Claims 1 and 2 characterized in that the fixed (4c) and movable (7) lateral parts of the pedal are supported by pressure during coupling against the lateral planes (1j1-1j2) of the wedge, thereby comprising some pinching members.

8. Assembly according to Claim 1 characterized in that the movable lateral part of the pedal is a ring (7) having general cylindrical shape and diameter greater than the diameter of the central part and than can move sideways between two interior (4g) and exterior (6) flanges that equip a cylindrical bearing surface (4f) formed according to the central part.

9. Assembly according to Claims 1 and 8 characterized in that the ring (7) can move in translational direction from the free end of

the pedal in opposition to the pre-stressed coil spring (B) and appropriately calibrated in a bore (7d) of the ring and supported on the one hand against an interior stop wall (7b) against the interior flange (4g) of the pedal and on the other hand against the exterior flange (6) of the pedal.

10. Assembly according to Claim 9 characterized in that the exterior flange (6) is a washer installed in sliding manner on the cylindrical bearing surface (4f) and serving as a sealing component. /9

11. Assembly according to Claims 1 and 9 characterized in that the ring (7) has between its internal wall (7b) and its end opposing the wedge a female connection and holding device produced in the form of a circular recessed area (7c).

12. Assembly according to Claims 1 and 8 characterized in that the fixed lateral part (4c) and the cylindrical bearing surface (4f) comprise with the central part (4d) the hub of the pedal equipped internally to receive, preferably in airtight manner, some ball bearings (RB), needle bearings (RA), or ball races (CB) appropriately installed in relation to a shaft (3) secured in the opening of the crank (M); the free end of the pedal being closed preferably in airtight manner by any means, such as a screwed plug.



